Greetings and welcome to the **JANUARY 2016** edition of the WDFW Climate News Digest – Happy New Year! The purpose of this newsletter is to provide highlights of relevant climate change news, events and resources for WDFW staff. Feedback or suggestions for items to include in future editions are much appreciated – many *thanks* to those who have sent links and references and please keep them coming.

Thanks for contributions this month from, Wendy Connally, Bill Tweit, Lee Rolle, Dale Gombert and Michael Cox (EPA). Other sources for news include: Point Blue Conservation Science, NPLCC Climate Science Digest, Climate.gov, NOAA Climate Newsletter, and "BioClimate", the newsletter of the USGS Climate Science Centers. Contact Lynn to subscribe directly to any of these.

WHAT'S HAPPENING AT WDFW?

Are you working on a project that may be affected by climate change? Have you considered or included climate change in research proposals, workshops or other activities? Please be in touch to share your news or experience!

WDFW hosts February 11th workshop on the Climate Change Vulnerability Assessment for 268 Species of Conservation Concern (in Olympia)

The purpose of the workshop is to develop familiarity with the methodology used to develop the Climate Vulnerability Assessment, which was conducted in part to support the 10-year update of the Washington State Wildlife Action Plan. We will also explore opportunities to apply the findings to species and habitat restoration and management planning activities across the agency. The workshop will be conducted by Jessi Kerschner, lead scientist for EcoAdapt, who developed the database with help and expertise provided by many WDFW biologists. Space is limited and nearly full - a few spots remain. For more information, or to be notified about future workshops, please contact Lynn.

CLIMATE ADAPTATION AT OTHER ORGANIZATIONS

Washington State Insurance Commissioner Kreidler joins Paris Pledge for Action on Climate Change

"A landmark international climate change agreement was reached at COP21 on Dec. 12 with the goal of limiting the global temperature rise to less than 2 degrees Celsius. I signed onto the Paris Pledge for Action on behalf of the Office of the Insurance Commissioner, along with more than 800 other organizations, businesses, investors, cities and regions. "This is a natural step for my office and is in keeping with my role as the chair of the National Association of Insurance Commissioner's Climate Change and Global Warming Working Group. Since 2010, I have been one of a handful of state insurance regulators requiring insurers to answer questions about their preparedness for climate change –from their ability to pay higher and more frequent claims to their investment practices."
Read the full statement.

How Prepared is Washington for Climate Change?

America's Preparedness Report Card, released in November, rates U.S. states on factors such as extreme heat, summer droughts, wildfires and flooding. The letter grades are tabulated by comparing what precautionary steps a state has taken relative to the climate threats it is expected to face in the future.

RESOURCES

Climate Change and Coastal Impacts Workshop for Media Professionals: Videos Now Available!
The Southeast Climate Science Center along with North Carolina Coastal Federation, Climate Central, and Climate Communication conducted a workshop in Beaufort, NC this past October to help media professionals become more knowledgeable about the state of the science on climate and be able to localize the impacts of climate change. Videos of presentations and sessions from the workshop are now available!

Stories from the Arctic: The village of Shishmaref, Alaska, will soon disappear – *from Department of Interior newsletter*
A remote village in the Arctic, Shishmaref, is on the frontline of climate change, and its residents are feeling the effects daily -- not only on their lives but their culture. 17-year-old Arctic Youth Ambassador Easu Sinnok shares the impacts he's experienced in his lifetime and why we all need to work together.

Climate Data *- from Climate.gov*
Explore this tool to access simple graphs of Climate Normal data for temperature and precipitation for 1981-2010 from weather stations across the country.

New Report Describes the Evaporative Demand Drought Index (EDDI)
The Western Water Assessment recently released a short informational report describing the Evaporative Demand Drought Index (EDDI). EDDI is a drought index that can serve as an indicator of both rapidly evolving "flash" droughts (developing over a few weeks) and sustained droughts (developing over months but lasting up to years). The report is sponsored in part by the North Central Climate Science Center's Climate Foundational Science Area.

Funding Opportunity from the Northwest CSC for Ecological Drought Research – *from the NW Climate Science Center*
The Northwest Climate Science Center is seeking Statements of Interest (SOIs) for innovative projects to help us assess which ecosystem components and ecological processes are most vulnerable to pronounced water deficiencies and to test or demonstrate new methods or technologies intended to lessen or adapt to the ecological impacts of drought. SOIs are due January 20, 2016.

Workshop Report: Impacts of Climate Change on Stream Temperature in Coldwater Fisheries in the PNW *(pdf attached)*
The US Environmental Protection Agency Region 10 (EPA Region 10) worked with Federal, State, and Tribal partners to convene a group of scientists and managers on November 17th and 18th 2014 to exchange ideas and learn about the observed and projected impacts of climate change on stream temperature in coldwater fisheries in the Pacific Northwest, and existing and future management and adaptation efforts. Funding for the workshop came from EPA's Office of Research and Development.

See Before-and-After Photos of the Changing Environment – *from National Geographic*
Side-by-side comparisons reveal just how much glaciers, lakes, and snowpacks have been altered by nature and humans.

Short Answers to Hard Questions About Climate Change
A helpful summary for the non-scientists among us, prepared by the New York Times.

LEARNING OPPORTUNITIES

January 12th, 12:00-1:00 (Pacific), "The West Coast Climate Forum: Pushing the Boundaries on Climate, Materials, and Sustainable Consumption". This talk, part of the EPA Climate Change Speaker Series, features Ashley Zanolli, who currently co-leads the West Coast Climate & Materials Management Forum, a partnership of western communities working together to drive climate action through materials management. Call-in: 1-866-299-3188, Code: 206-553-1597#
Adobe Connect: https://epawebconferencing.acms.com/r3y572rrhby/

January 13th, 11:00-12:00 (Pacific), webinar, "Ranking Watersheds for Climate Change Resilience Using Historical Snowpack Data", presented by Len Broberg, University of Montana. Sponsored by the Great Northern Landscape Conservation Cooperatives. Register here.

January 13th, workshop, "Climate Change Research and Action in Washington State", Olympia
The Evergreen State College will convene policy makers, industry leaders, research and advocacy groups together with students, faculty, staff and the greater community on January 13 for a day of talks on climate change and regional solutions. The symposium, entitled "It's Happening. What Now? Climate Change Research and Action in Washington State," features Nobel Prize honoree John Byrne, Ph.D. as its keynote speaker. The event takes place at the college's main campus at 2700 Evergreen Parkway NW in Olympia. It is free and open to the public.

January 20th, 11:00-12:00, (Pacific), webinar, Climate Change Adaptation — from Concept to Standard Practice
Please join us for this webinar hosted by the Great Northern, Southern Rockies, and North Pacific LCCs. Presenters: Dave Peterson, U.S. Forest Service Pacific Northwest Research Station and Jessica Halofsky, University of Washington

CLIMATE SCIENCE NEWS

Global is the new local: Pollution changes clouds, climate downstream – *from NASA*
Researchers at NASA's Jet Propulsion Laboratory and the California Institute of Technology, both in Pasadena, California, are looking at how Asian pollution is changing weather and climate around the globe.

Carbon content of temperate forests may be overestimated – *from Science Daily*
Digital measurements of millions of trees indicate that previous studies likely overestimate the amount of carbon stored by temperate US forests, according to a new study. The findings could help scientists better understand the impact that trees have on the amount of carbon in the atmosphere. Although it is a well-established fact that trees absorb carbon and store it long-term, researchers are unsure how much is stored in global forests.

Groundwater depletion adding to global sea-level rise - *from Astrobiology Magazine*
USGS hydrologists have calculated estimates of the amounts of groundwater depleted annually since 1900, and their findings show depletion occurring at an accelerating pace – which in turn is pushing the levels of the oceans higher.

SPECIES AND HABITATS

Study examines effect of warming waters on mussels – *from Washington Sea Grant*

Washington Sea Grant-supported researchers at University of Washington's Friday Harbor Labs are investigating potential climate-related threats to the amazingly tough mussel threads that anchor them to wave-pounded rocks and docks

Animals play role in healthy forests – *from Science Advances*
New research suggest that the decline in animal populations in tropical forests may play a role in accelerating climate change.
Read summary from Time magazine.

Don't forget plankton in climate change models – *from Science Daily*
Globally, phytoplankton absorb as much carbon dioxide as tropical rainforests and so understanding the way they respond to a warming climate is crucial, say scientists. A new study from the University of Exeter, published in the journal *Ecology Letters*, found that phytoplankton -- microscopic water-borne plants -- can rapidly evolve tolerance to elevated water temperatures. Globally, phytoplankton absorb as much carbon dioxide as tropical rainforests and so understanding the way they respond to a warming climate is crucial. Phytoplankton subjected to warmed water initially failed to thrive but it took only 45 days, or 100 generations, for them to evolve tolerance to temperatures expected by the end of the century.

Plants are protecting us from climate change – for now – *from UW Conservation Magazine*
As the concentration of CO_2 in the atmosphere increases, so does the amount of carbon that plants sequester in their own tissues through photosynthesis. This so-called "CO_2 fertilization effect" is well known in a general sense. But until now, scientists haven't been able to quantify how much it might dampen the impact of our carbon emissions in the real world. A group of Swedish researchers has solved this problem by looking to the past, comparing carbon metabolism in century-old herbarium specimens and modern plants. They say their study, the first to use historical specimens to document a shift in plant metabolism, will help scientists build more accurate global climate models in the future.

Arctic Report Card Highlight – *from Climate.gov*
Warming waters shift fish communities northward in the Arctic

Changing recruitment capacity in global fish stocks – *from PNAS*
Marine fish stocks play an important role in marine ecosystems and provide a source of protein for billions of people worldwide. Recent environmental changes have affected the distribution of many stocks, but it is yet unclear whether their productivity is affected as well. We show that recruitment capacity (the ability of stocks to produce surviving offspring) has been significantly altered by both environmental changes and biological changes brought about by overfishing. In total, these effects have reduced recruitment capacity by 3% of the historical maximum per decade, on average. This paper helps us to understand and track previously unrecognized changes in fish stock productivity during the early stages of their life cycle.

Coastal marshes more resilient to sea-level rise than previously believed – *from Science Daily*
Rising seas threaten coastal marshes worldwide. But a new study finds marshes are more resilient than previously believed. Elevated levels of atmospheric CO2 boost plant biomass production, allowing marshes to trap more sediment and generate more organic soil. This may elevate the threshold rate of relative sea-level rise at which marsh drowning is initiated by up to 60 percent and partially offset the effects of reduced sediment delivery and accelerating sea-level rise. The research, published this month in the *Proceedings of the National Academy of Sciences*, shows that the significant boost in marsh plant productivity associated with elevated levels of atmospheric carbon dioxide will allow marshes to trap more sediment and create more organic soil. This, in turn, will result in increased rates of accretion that will allow

marshes to keep up with rising sea levels and may increase the thresholds for marsh drowning by up to 60 percent.

Marshes to mudflats—Effects of sea-level rise on tidal marshes along a latitudinal gradient in the PNW – *from USGS*

In the Pacific Northwest, coastal wetlands support a wealth of ecosystem services including habitat provision for wildlife and fisheries and flood protection. Climate change effects such as sea-level rise are altering these habitats, but we know little about how these areas will change over the next 50–100 years. Our study examined the effects of sea-level rise on nine tidal marshes in Washington and Oregon between 2012 and 2015, with the goal of providing scientific data to support future coastal planning and conservation. We compiled physical and biological data, including coastal topography, tidal inundation, vegetation structure, as well as recent and historical sediment accretion rates, to assess and model how sea-level rise may alter these ecosystems in the future. Our main model finding is that most tidal marsh study sites are resilient to sea-level rise over the next 50–70 years, but that sea-level rise will eventually outpace marsh accretion and drown most habitats of high and middle marshes by 2110.

Predators key to helping prey evolve with climate change - *from Science Daily*

The key to helping animals evolve quickly in response to climate change could actually be their predators, according to a new study. The study is one of the first to show that species interactions, meaning the way species interact with each other in an ecosystem, like in a predator-prey relationship, is important to understanding how animals will respond to climate change. The findings, published in *Biology Letters*, have implications for ecosystems around the world where many top predators like sharks or polar bears are disappearing because of increasing pressure from climate change and human populations.

Chickadee research predicts drastic northward shift for southern species - *from Science Daily*

New research on northern (black-capped) and southern (Carolina) species of chickadees offers some answers. Amber Rice, assistant professor of biological science at Lehigh and her co-author Michael A. McQuillan, a graduate student studying integrative and evolutionary biology, looked at the predicted effects of climate change on both species of chickadee with an eye toward examining how rising temperatures are influencing their location.

POLICY AND MANAGEMENT - MITIGATION AND ADAPTATION

Historic Paris Agreement on Climate Change – *from the United Nations Newsroom*

195 Nations Set Path to Keep Temperature Rise Well Below 2 Degrees Celsius

An historic agreement to combat climate change and unleash actions and investment towards a low carbon, resilient and sustainable future was agreed by 195 nations in Paris. This Agreement for the first time brings all nations into a common cause based on their historic, current and future responsibilities. The universal agreement's main aim is to keep a global temperature rise this century well below 2 degrees Celsius and to drive efforts to limit the temperature increase even further to 1.5 degrees Celsius above pre-industrial levels. The 1.5 degree Celsius limit is a significantly safer defense line against the worst impacts of a changing climate. Additionally, the agreement aims to strengthen the ability to deal with the impacts of climate change.

- Watch a message from President Obama – *from the Whitehouse*
- What does a climate deal mean for the world? - *from the New York Times*

You can read the final document here